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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LE, DUNG ANH

ART UNIT

PAPER NUMBER

2818

DATE MAILED: 10/08/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
10/178,019

Applicant(s)
YOSHITOMI, TAKASHI

Examiner

Art Unit

DUNG A LE

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 21 February 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-32 is/are pending in the application.
- 4a) Of the above claim(s) 13-25 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-12 and 26-32 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Oath/Declaration

The oath/declaration filed on 2/21/2002 is acceptable.

Election/Restriction

Applicant's election with traverse of claims 1-12 (Species I) in Paper No. 3 is acknowledged and add newly claims 26-32.

Because Applicant did not distinctly and specifically point out the supposed error in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Applicants have the right to file a divisional, continuation or continuation-in-part application covering the subject matter of the non-elected claims 13-25 (Species II).

The traversal is on the ground(s) that see the election paper. This is not found persuasive because the fields of search for Species claims are NOT coextensive and the determinations of patentability of Species I and II claims are different, that is Species I limitations and Species II limitations are given weight differently in determining the patentability of the claimed inventions. Also, the strategies for doing text searching of the Species I and II claims are different. Thus, separate searches are required.

The requirement is still deemed proper and is therefore made **FINAL**.

Information Disclosure Statement

This office acknowledges of the following items from the Applicant:

Information Disclosure Statement (IDS) filed on 6/5/2002 and made of record as Paper No.2. The references cited on the PTOL 1449 form have been considered.

Specification

The specification is objected to for the following reason:

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed (see MPEP § 606.01). Note that, the invention is related to the method of forming a dielectric layer.

The specification has been checked to the extent necessary to determine the presence of all possible minor errors. However, the applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections

Set of Claims: 1-8.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1, 2, 5, 6 and 8 are rejected under 35 USC 102 (e) as being anticipated by Huang et al. (6291288).

Huang et al. disclose a method of forming a dielectric layer on a semiconductor device comprising:

providing a substrate having at least one semiconductor layer; forming a first conductive layer 100 over at least a portion of the substrate (col 3, lines 26-33); depositing a silicon-containing material from a silicon source over the first conductive layer 100;

forming the dielectric layer 130 by processing the deposited silicon-containing material with a reactive agent selected to react with silicon atoms of the deposited silicon-containing material (col 4, lines 3-15); and

Regarding claim 2. The method of claim 1, wherein the silicon source is silazane (col 4, lines 5-10).

Regarding claim 5, the reactive ambient is selected from the group comprising NH₃, N₂, O₂, O₃, N₂O and NO (col 4, line 8).

Regarding claims 6, the dielectric layer 130 is primarily nitride (col 4, line 4).

Regarding claim 8, the dielectric layer is about 45 Angstroms or less in thickness (col 4, line 5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 4 and 7 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Huang et al. (6291288) in view of the remark.

Huang et al. disclose the silicon-source is from SiH₄ but fail to disclose the silicon-source is from the group comprising hexamethyldisilazane, tetramethyldisilazane, octamethylcyclotetrasilazane, hexamethylcyclotrisilazane, diethylaminotrimethylsilane and dimethylaminotrimethylsilane ; the silicon source comprises a self limiting hexamethyldisilazane source and the dielectric layer is primarily oxide.

forming a second conductive layer 150 over the dielectric layer 130.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the abovementioned silicon-source because it is commonly used to form dielectric layer, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416.

Set of claims: 9-11 and 12.

Claims 9- 12 are rejected under 35 USC 102 (e) as being anticipated by Huang et al. (6291288).

Huang et al. disclose a method of forming a dielectric layer on a semiconductor device comprising:

providing a substrate having at least one semiconductor layer; fabricating the semiconductor device proximate to the substrate (col 27-33 and fig.1):

vapor depositing a silicon-containing material from a silazane source over at least a portion of the semiconductor device; and forming the dielectric layer 130 by processing the silicon-containing material in a reactive ambient (col 3-15).

Regarding claim 10, vapor depositing a silicon-containing material from a silazane source over at least a portion of the semiconductor device is repeated at least once prior to forming the dielectric layer by processing the silicon-containing material in a reactive ambient (col 4, lines 47-56).

Regarding claim 11, the reactive ambient is NH₃ (col 4, line 8).

Regarding claim 12, Huang et al. disclose a method of forming a dielectric layer comprising:

providing a substrate having at least one semiconductor layer (col 3, lines 27-33 and fig. 1);

vapor depositing a silicon-containing material (col 4, line 4-10) from a self limiting silicon source over at least a portion of the substrate; and

forming the dielectric layer 130 by processing the silicon-containing material in a reactive ambient at a processing temperature, a processing time and a processing pressure selected to result in a desired dielectric constant and leakage characteristics (col 4, line 10).

Set of claims: 26- 30

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 26- 29 are rejected under 35 USC 102 (e) as being anticipated by Huang et al. (6291288).

Huang et al. teach a method of forming a dielectric layer comprising:

As set forth in column 4, lines 3-19. Huang et al. disclose the step of providing a substrate having at least one semiconductor layer; depositing a silicon-containing material from a silicon source over at least a portion of the substrate; and forming the dielectric layer 130 by processing the silicon-containing material in a reactive ambient.

Regarding claim 27, silicon source is self-limiting (col 4, lines 5-10).

Regarding claim 28, silicon-containing material is deposited in a plurality of layers.

Regarding claim 29, depositing a second dielectric layer 140 over the dielectric layer 130.

Regarding claim 30, the silicon-containing material is vapor deposited (col 4, line 5).

Set of claims: 31-32.

Claims 30-31 are rejected under 35 USC 102 (e) as being anticipated by Chew et al. (6258653).

Chew et al. disclose a method of forming a dielectric layer comprising:
providing a substrate having at least one semiconductor layer 12; vapor depositing a silicon-containing material comprising a silazane over at least a portion of the substrate (col 3, lines 55-63); and forming a dielectric layer 14 by rapidly thermally nitridizing the deposited silicon containing material in a nitridizing agent (col 4, lines 15-30).

Regarding claim 32, depositing a second dielectric layer 16 over the dielectric layer 14 (fig. 1).

When responding to the office action, Applicants' are advice to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist the examiner to locate the appropriate paragraphs.

A shortened statutory period for response to this action is set to expire 3 (three) months and 0 (zero) day from the day of this letter. Failure to respond within the period for response will cause the application to become abandoned (see M.P.E.P 710.02(b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dung A. Le whose telephone number is 703-306-5797. The examiner can normally be reached on Monday-Friday 8:00am-5: 30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Nelms can be reached on 703-308-4910. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Dung A. Le

Date: 10/02

Dung A. Le
Examiner
Art Unit: 2818